Bottle Cutting

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TOOLS:

- Bottle cutting jig (1)
- Butane torch (1)
- Glass-cutting wheel (1)
- Plate glass (1)
- Rotating platform (1)

PARTS:

- Glass bottle (1)
- Sandpaper (1)
  or a finishing sander wheel
- Silicon carbide grit (1)
- Water (1)
- Oil (1)
  for glass cutting wheel

SUMMARY

There are lots of ways to do this particular trick. You may have seen bottles "cut" using a bucket of ice water, a string soaked in fuel and set alight, a hot narrow gauge resistive wire, or some combination of the above. I've tried all of these ways, at one point or another, with varying degrees of success, and I'm reporting here the method that gives most consistent results for me. But if you're interested in trying some other way, by all means experiment. Glass bottles are freely available just about everywhere, and you can always recycle your mistakes.

Regardless of which of these methods you favor, "bottle cutting" is generally a misnomer, as what's really going on is a process of controlled breakage. (Unless, of course, you're actually using a tile saw or something similar, in which case I'm prepared to agree it's really

"cutting.")

Anyway. Glass, molecularly, is mostly silicon dioxide, but it's distinct from crystalline solids like ice or table salt in that the molecules are not well-ordered in space. You may have heard some balderdash about how glass is really a liquid with practically infinite viscosity; generally the swelling of ancient cathedral windows at the bottom is cited as evidence to that effect. Well, it's not true: There is, to my knowledge, no reliable evidence that glass will flow at room temperature regardless of how long you wait. Turns out cathedral glaziers made their windows thicker at the bottom on purpose.

But as an analogy, "infinitely viscous liquid" is not a bad way to understand the random molecular ordering of bulk glass. The upshot of this anisotropy is that glass does not cleave in orderly ways: Cracks tend to wander off in random, unpredictable directions, and shattering can easily occur due to internal stresses. There is, therefor, an element of luck involved in the bottle cutting operation, but with a bit of practice and good technique you can make it work most of the time.

Step 1 — Select a bottle.

- Your choice of bottle depends on what you want to do with the finished piece. Are you making a drinking vessel? A flower pot? A lampshade? Very often people are interested in cutting a particular bottle that has unique aesthetic or sentimental appeal. A special bottle of booze or wine, well-cut to make a useful container, can make a great gift for the person you shared it with.
- Before you attempt to cut a valuable bottle, however, you should develop skill with bottles that are disposable to you. You will almost certainly ruin a few getting the hang of the process.

Step 2 — Score the bottle.

- It is important that the bottle be scored cleanly and evenly in a circle around its circumference. Inexpensive jigs are available commercially for this purpose. Get a quality metal one, or build one yourself, and steer away from plastic jigs hyped on late-night TV and the like.
- The cutting jig is first set to accurately position the cut along the length of the bottle. Then a drop of cutting oil is applied to the built-in glasscutting wheel. Now, set the bottle in place and apply firm pressure towards the cutting wheel as you rotate about the bottle's axis. Maintain continuous pressure as you rotate, and stop as soon as the scoreline comes all the way 'round and meets itself. Resist the temptation to go over the same scoreline more than once. This will only lead to a messy break.

Step 3 — Apply heat.

- Position the bottle upright in the center of your turntable. Spin it around a few times to make sure the bottle is well-centered, then fire up your torch. Direct the flame just slightly above the scoreline, about four inches away, and steadily rotate the turntable with your free hand. The rotation doesn't have to be very fast, but it should be constant and even. The goal, obviously, is to evenly heat the bottle around the scoreline. Uneven heating, again, can lead to cracks wandering off in all directions.
- You will hear a series of clicks and pops as the bottle breaks. You can also, generally, see the break as it propagates around the glass. Continue rotating and applying heat until the break is complete, removing the flame and testing occasionally by lifting the bottle from its neck. When the cut is complete, the top of the bottle will lift off with no effort. Be patient at all times. Nothing in this process can be forced.

Step 4 — Polish the edge.

- If everything went well, you now have one or more bottle sections with relatively clean breaks along their edges. Some small deflection, especially where the beginning and end of the scoreline meet, is common and can be polished out. Bumps or jogs much larger than 1mm, however, become increasingly tedious to grind away, although it can be done if you're persistent. It's generally much faster to just cut another bottle than to try to repair a fracture gone awry.
- The edge is polished by lapping against a piece of scrap plate glass. This can be window glass, a bit of mirror, or, as in my case, the plate from an old broken scanner. Dump a pinch of grit into the center of the lapping glass and wet it with a spray bottle. Then set the bottle section edge-down against the abrasive surface and, applying light pressure, scrub it around in a figure-eight motion. Be aware that the sound this makes can set your teeth on edge, if you're sensitive, so you may want to wear ear protection just for the sake of aesthetics. But it's not loud enough to be dangerous.
- Continue lapping, adding grit and/or water to the slurry as necessary, until the edge is completely polished. Unfortunately wetting can make this difficult to tell, so keep at it until it feels done, then wipe off the edge with a paper towel until it's completely dry. Now, it should be easy to tell if you need to polish some more or not: The edge should be smoothly and uniformly "etched" all over, with no glossy spots remaining.

Step 5 — Round over the "corners."

- The lapping process will produce a very flat edge which, where it intersects with the sides of the bottle, can make for a fairly sharp corner in cross-section. Particularly if you want to use the cut bottle as a drinking vessel, I recommend that you take a minute to lightly break the inner and outer corners with a scrap of silicon carbide sandpaper. The easiest way to test this process is by touch: Continue until the corner feels comfortably smooth to a fingertip run around the edge.

I have found that the use of a turntable during the heating process makes a significant difference. Attempting to manually rotate the bottle never works so well for me, but if I use a turntable the breaking process is quite reliable. The turntable I use is the bottom part of a cheap plastic rotating shelf intended to keep spices in the kitchen cupboard.

If you want a neater polished edge, you can use a series of grits of increasing fineness to do the lapping. A recharge kit for a rock polisher can be a good source for these. If you want to go this way, proceed (obviously), from larger to smaller grit, clean the edge thoroughly between steps, and be certain to use a separate lapping plate for each grit. Contamination of finer with larger grits can spoil the polishing effect.

The physical details of the bottle you choose to cut can also make a big difference. Generally, straight-sided bottles are easier to score evenly than those with round or sloping sides, so you may want to limit yourself to those at first. Many bottles have features I call "useful inclusions," which are rings or grooves molded in around the bottle's circumference. These are handy for two reasons: 1) Siting a cut at such an inclusion generally results in a better-looking finished piece,

and 2) the inclusion itself can be used to guide a manual glasscutting wheel, eliminating the need for a bottle-cutting jig.

How the bottle is labeled can be important. I personally prefer bottles with painted-on labels, like Corona bottles, because the markings will stand up to wear, water, and washing over time and will continue to show off the origins of the piece throughout its lifetime. Or you can simply remove the labels altogether. Paper labels are generally the toughest to clean off; and the best tool I've found for this process is the wire wheel on a bench grinder. Even so, you may have to wipe off the remaining glue using Goo-Gone and/or lighter fluid.

If you plan to etch your bottle in some way, it is possible to use the label as a built-in resist. Just cut the design you want etched into the label, peel off the positive areas, and apply etching cream as usual. Adhesive plastic labels work best for this process; paper ones will result in messy edges where the etching cream bleeds under. When the etch is complete, just remove the remaining label as you normally would.

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